

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
 REQUEST FOR FILING NATIONAL PHASE OF
 PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

097 806463

To: Hon. Commissioner of Patents
 Washington, D.C. 20231



00909

TRANSMITTAL LETTER TO THE UNITED STATES
 DESIGNATED/ELECTED OFFICE (DO/EO/US)

Atty Dkt: P 279296 /2980338US/HM/kp
 M# /Client Ref.

From: Pillsbury Winthrop LLP, IP Group:

Date: Monday, April 2, 2001

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

- | | | |
|---------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1. International Application

PCT/FI99/00813
<u>country code</u> | 2. International Filing Date

1 October 1999
Day MONTH Year | 3. Earliest Priority Date Claimed

1 October 1998
Day MONTH Year
(use item 2 if no earlier priority) |
|---------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
4. Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

(a) ☐ 20 months from above item 3 date (b) ☒ 30 months from above item 3 date,

(c) Therefore, the due date (unextendable) is April 1, 2001

5. Title of Invention METHOD OF DETERMINING HOME AREA FOR SUBSCRIBER TERMINAL, AN ASSOCIATED RADIOSYSTEM AND A SUBSCRIBER NETWORK ELEMENT

6. Inventor(s) AHOLA, Ossi et al

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7. ☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file if in English but, if in foreign language, file only if not transmitted to PTO by the International Bureau) including:

- a. ☐ Request;
 b. ☐ Abstract;
 c. ___ pgs. Spec. and Claims;
 d. ___ sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9. ☒ A copy of the International Application has been transmitted by the International Bureau.

10. A translation of the International Application into English (35 U.S.C. 371(c)(2))

- a. ☒ Is transmitted herewith including: (1) ☒ Request; (2) ☒ Abstract;
 (3) 16 pgs. Spec. and Claims;
 (4) 3 sheet(s) Drawing which are:
☐ informal ☒ formal of size ☒ A4 ☐ 11"
- b. ☐ Is not required, as the application was filed in English.
 c. ☐ Is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
 d. ☐ Translation verification attached (not required now).

RE: USA National Phase Filing of PCT /F199/00813

532 Rec'd PCT/PTO 02 APR 2001

11. ☒ Please see the attached Preliminary Amendment
12. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., before 18th month from first priority date above in item 3, are transmitted herewith (file only if in English) including:
13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau
14. ☐ Translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of claim amendments made before 18th month, is attached (required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments will be considered canceled).

15. **A declaration of the inventor** (35 U.S.C. 371(c)(4))

- a. ☐ is submitted herewith ☐ Original ☐ Facsimile/Copy
- b. ☒ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

16. **An International Search Report (ISR):**

- a. Was prepared by ☐ European Patent Office ☐ Japanese Patent Office ☒ Other
- b. ☒ Has been transmitted by the international Bureau to PTO.
- c. ☒ Copy herewith (2 pg(s.)) ☒ plus Annex of family members (1 pg(s.)).

17. **International Preliminary Examination Report (IPER):**

- a. ☒ Has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
- b. ☒ Copy herewith in English.
- c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
- c.2 ☐ Specification/claim pages # ___ claims # ___
- Dwg Sheets # ___
- d. ☐ Translation of Annex(es) to IPER (required by 30th month due date, or else annexed amendments will be considered canceled).

18. **Information Disclosure Statement** including:

- a. ☒ Attached Form PTO-1449 listing documents
- b. ☒ Attached copies of documents listed on Form PTO-1449
- c. ☒ A concise explanation of relevance of ISR references is given in the ISR.

19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.

20. ☐ Copy of Power to IA agent.

21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): ___ sheet(s) per set: ☐ 1 set informal; ☐ Formal of size ☐ A4 ☐ 11"

22. Small Entity Status ☒ is **Not** claimed ☐ is claimed (pre-filing confirmation required)

22(a) (No.) Small Entity Statement(s) enclosed (since 9/8/00 Small Entity Statements(s) not essential to make claim)

23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) FINLAND of:

	Application No.	Filing Date	Application No.	Filing Date
(1)	982126	October 1, 1998	(2)	
(3)			(4)	
(5)			(6)	

- a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
- b. ☐ Copy of Form PCT/IB/304 attached.

532 Rec'd PCT/PTO 02 APR 2001

24. Attached: Preliminary Amendment and a copy of Finnish OA

25. Per Item 17.c2, **cancel original** pages # __, claims # __, Drawing Sheets #26. **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**Based on amended claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☒ 24 (h/ite)

Total Effective Claims	20	minus 20 =	0	x \$18/\$9	=	\$0	966/967
Independent Claims	8	minus 3 =	5	x \$80/\$40	=	\$400	964/965
If any proper (ignore improper)		Multiple Dependent claim is present,		add \$270/\$135	=	+0	968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): →→ **BASIC FEE REQUIRED, NOW** →→→→A. If country code letters in item 1 are **not** "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

See item 16 re:

1. Search Report was <u>not prepared by EPO or JPO</u> -----	add \$1000/\$500		960/961
2. Search Report was prepared by EPO or JPO -----	add \$860/\$430	+1000	970/971

SKIP B, C, D AND E UNLESS country code letters in item 1 are "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

→ <input type="checkbox"/> B. If USPTO did not issue both International Search Report (ISR) and (if box 4(b) above is X'd) the International Examination Report (IPER), -----	add \$970/\$485	+0	960/961
→ <input type="checkbox"/> C. If USPTO issued ISR but not IPER (or box 4(a) above is X'd), -----	add \$710/\$355	+0	958/959
→ <input type="checkbox"/> D. If USPTO issued IPER but IPER Sec. V boxes <u>not all 3</u> YES, -----	add \$690/\$345	+0	956/957
→ <input type="checkbox"/> E. If international preliminary examination fee was paid to USPTO and Rules 492(a)(4) and 496(b) <u>satisfied</u> (IPER Sec. V <u>all 3</u> boxes YES for <u>all</u> claims), -----	add \$100/\$50	+0	962/963
SUBTOTAL =			\$1400

28. If Assignment box 19 above is X'd, add Assignment Recording fee of ---\$40 +0 (561)

29. Attached is a check to cover the ----- **TOTAL FEES** **\$1400**

Our Deposit Account No. 03-3975

Our Order No. 60258

C#

279296

M#



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CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 18-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.

This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed

Pillsbury Winthrop LLP
Intellectual Property Group

By Atty: Christine H. McCarthyReg. No. **41844**Sig: [Signature]

Fax: (202) 822-0944
 Tel: (202) 861-3075

Atty/Sec: CHM/mhn

NOTE: File in duplicate with 2 postcard receipts (PAT-103) & attachments.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF

Confirmation No.: Unknown

AHOLA et al.

Group Art Unit: Unknown

Appln. No.: FILED HEREWITH

Examiner: Unknown

Filed: HEREWITH

Title: METHOD OF DETERMINING HOME AREA FOR SUBSCRIBER TERMINAL,
AN ASSOCIATED RADIO SYSTEM AND A SUBSCRIBER NETWORK ELEMENT

April 2, 2001

* * * * *

PRELIMINARY AMENDMENT

Hon. Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to initial examination on the merits, please amend the above-identified application as follows:

IN THE SPECIFICATION:

At the top of the first page, just under the title, insert

☒ --This application is the National Phase of International Application
PCT/FI99/00813 filed October 1, 1999 which designated the U.S.

and that International Application

[X] was [] was not Published under PCT Article 21(2) in English.- -

IN THE CLAIMS:

Please enter the following amended claims 1-10:

1. (Amended) A method of determining a home area for a subscriber terminal in a radio system where the subscriber terminal includes measuring means

for measuring strengths of signals received from different base stations and for storing measurement results in a memory, the method comprising:

- receiving a location updating message from the subscriber terminal;
- transmitting a command to the subscriber terminal after the location updating message has been received, wherein the command is to transmit the measurement results stored in the memory of the subscriber terminal;
- receiving the measurement results from the subscriber terminal;
- identifying the base stations with the greatest signal strengths at least partially based on the measurement results; and
- determining the home area of the subscriber terminal such that the home area includes at least one of the identified base stations.

2. (Amended) The method of claim 1, further comprising preventing the subscriber terminal from setting up communication links via base stations other than those which belong to the subscriber terminal's home area after determining the home area for the subscriber terminal.

3. (Amended) The method of claim 1, wherein the subscriber terminal is a new subscriber terminal and the method further comprises:

- adding an identity of the subscriber terminal to a register of new subscribers of at least one subscriber network element in the system; and
- providing the subscriber terminal with free mobility for the duration of the determination of the home area, such that the subscriber terminal operates within an area covered by at least one of the subscriber network elements having the identity of the subscriber terminal in the register of new subscribers thereof.

4. (Amended) The method of claim 1 further comprising changing the home area after the home area has been previously determined for the subscriber terminal, the changing including:

- adding the identity of the subscriber terminal to the register of new subscribers of at least one subscriber network element in the system;

providing the subscriber terminal with free mobility for the duration of the determination of the home area, such that the subscriber terminal operates in both the determined home area and in an area covered by at least one of the subscriber network elements having the identity of the subscriber terminal in the register of new subscribers thereof; and

waiting for a location updating message to be forwarded from the subscriber terminal via at least one of the subscriber network elements having the identity of the subscriber terminal in the register of new subscribers thereof.

5. (Amended) A wireless local loop radio system comprising:

a plurality of subscriber terminals including:

measuring means for measuring strengths of signals received from different base stations and for storing measurement results in a memory, and

transmitting means for transmitting location updates to other parts of the system;

a subscriber network element configured to communicate with an exchange and including transmitting means for transmitting telecommunication signals between the subscriber terminals and the exchange via the base stations;

detecting means for detecting a location updating message transmitted by a particular subscriber terminal;

command transmitting means for transmitting a command to the particular subscriber terminal after detecting the location updating message transmitted by the subscriber terminal, wherein the command is to transmit the measurement results stored in the memory of the subscriber terminal;

receiving means for receiving the measurement results transmitted by the subscriber terminal;

identifying means for identifying the base stations with the strongest signals at least partially based on the measurement results received from the subscriber terminal; and

determining means, responsive to the identification means, for determining a home area for the subscriber terminal such that the home area includes at least one of the identified base stations.

6. (Amended) The radio system of claim 5, wherein

the subscriber network element communicates with a local exchange of a public switched telephone network to transmit telecommunication signals between the subscriber terminals and the local exchange via the base stations, wherein the subscriber network element is provided with a register of new subscriber terminals, and

wherein the detection means detects location updating messages transmitted by one of the subscriber terminals the identity of which is stored in the register of new subscriber terminals.

7. (Amended) The radio system of claim 5, wherein the subscriber network

element includes a base station controller, the base station controller being configured to communicate with a mobile services switching centre to transmit telecommunication signals between the subscriber terminals and the mobile services switching centre via the base stations.

8. (Amended) A subscriber network element comprising:

transceiving means for setting up a communication link to an exchange for transmitting telecommunication signals between subscriber terminals and the exchange;

a register of new subscriber terminals being configured to store identities of new subscriber terminals,

detecting means for detecting a location updating message containing the subscriber identity stored in the register of the new subscriber terminals;

transmitting means for transmitting a command to a particular subscriber terminal which transmitted the location updating message after the detection of the

location updating message, wherein the command is to transmit the measurement results stored in the memory of the particular subscriber terminal;

receiving means for receiving the measurement results transmitted by the subscriber terminal;

identifying means for identifying the base stations with the strongest signals at least partially based on the measurement results received from the subscriber terminal; and

determining means, responsive to the identification means, for determining a home area for the subscriber terminal such that the home area includes at least one of the identified base stations.

9. (Amended) A subscriber terminal of a radio system, comprising:

transceiving means for setting up a communication link via a radio path to other parts of the system;

measuring means for measuring strengths of signals received from different base stations and for storing measured results in a memory; and

transmitting means for transmitting a location updating message to the other parts of the system,

wherein the transceiving means are arranged to transmit the measurement results stored in the memory to the other parts of the system in response to a predetermined command received by the subscriber terminal.

10. (Amended) The subscriber terminal of claim 9, wherein the transmitting means are arranged to transmit the measurement results in a short message to the other parts of the system.

See the attached Appendix for the changes made to effect the above claims.

Please add the following new claims 11-20:

11. (New) A wireless local loop radio system comprising:

a plurality of subscriber terminals each including:

a measuring unit configured to measure strength of signals received from different base stations and to store measurement results in a memory, and

a transmitting unit configured to transmit location updates to other parts of the system;

a subscriber network element configured to communicate with an exchange and including a transmitter configured to transmit telecommunication signals between the subscriber terminals and the exchange via the base stations;

a detecting unit configured to detect a location updating message transmitted by a particular subscriber terminal included in the plurality of subscriber terminals;

a command transmitting unit configured to transmit a command to the particular subscriber terminal after detecting a location updating message transmitted by the particular subscriber terminal, wherein the command is to transmit the measurement results stored in the memory to the particular subscriber terminal;

a receiving unit configured to receive the measurement results transmitted by the particular subscriber terminal;

an identifying unit configured to identify the base stations with the strongest signals at least partially based on the measurement results received from the subscriber terminal; and

a determining unit, responsive to the identifying unit, configured to determine a home area for the particular subscriber terminal such that the home area includes at least one of the identified base stations.

12. (New) A radio system according to claim 11, wherein the subscriber network element communicates with a local exchange of a public switched telephone network to transmit telecommunication signals between the subscriber terminals and the local exchange via the base stations,

wherein the subscriber network element is provided with a register of new subscriber terminals, and

wherein the detecting unit is configured to detect location updating messages transmitted by one of the plurality of subscriber terminals, the identity of which is stored in the register of new subscriber terminals.

13. (New) A radio system according to claim 11, wherein the subscriber network element includes a base station controller of a cellular radio system, the base station controller being configured to communicate with a mobile services switching centre to transmit telecommunication signals between the subscriber terminals and the mobile services switching centre via the base stations.

14. (New) A subscriber network element comprising:

a transceiver unit configured to set up a communication link to an exchange for transmission of telecommunication signals between a plurality of subscriber terminals and the exchange;

a register of new subscriber terminals configured to store identities of new subscriber terminals,

a detecting unit configured to detect a location updating message containing the subscriber terminal identity stored in the register;

a transmitting unit configured to transmit a command to the particular subscriber terminal which transmitted the location updating message after detection of the location updating message, the command being to transmit measurement results stored in a memory of the particular subscriber terminal to the subscriber network element;

a receiving unit configured to receive the measurement results transmitted by a particular subscriber terminal included in the plurality of subscriber terminals;

an identifying unit configured to identify the base stations with the strongest signals at least partially based on the measurement results received by the receiving unit; and

a determining unit, responsive to the identifying unit, configured to determine a home area for the particular subscriber terminal such that the home area includes at least one of the identified base stations.

15. (New) A subscriber terminal of a radio system, comprising:

a transceiving unit configured to set up a communication link via a radio path to other parts of the system and configured to transmit measurement results stored in a memory to the other parts of the system in response to a predetermined command received by the subscriber terminal;

a measuring unit configured to measure signal strengths received from different base stations to produce the measurement results and configured to store the measurement results in the memory; and

a transmitting unit configured to transmit a location updating message to the other parts of the system.

16. (New) The subscriber terminal of claim 15, wherein the transmitting unit is configured to transmit the measurement results in a short message to the other parts of the system.

17. (New) A method of determining a home area for a subscriber terminal in a radio system including at least one subscriber network element, the subscriber terminal including a measuring unit configured to measure strength of signals received from different base stations and configured to store resulting measurement results in a memory, the method comprising:

transmitting a location updating message to the at least one subscriber network element;

receiving a command from the at least one subscriber network element after the location updating message has been received, wherein the command is to transmit the measurement results stored in the memory to the at least one subscriber network element;

transmitting the measurement results to the at least one subscriber network element;

identifying the base stations with the greatest strengths of signals at least partially based on the measurement results; and

determining the home area of the subscriber terminal such that the home area includes at least one of the identified base stations.

18. (New) The method of claim 17, further comprising preventing the subscriber terminal from setting up communication links via base stations other than those which belong to the subscriber terminal's home area after determining the home area for the subscriber terminal.

19. (New) The method of claim 17, wherein the subscriber terminal is a new subscriber terminal and the method further comprises:

adding an identity of the subscriber terminal to a register of new subscribers of at least one subscriber network element in the system; and

providing the subscriber terminal with free mobility for the duration of the determination of the home area, such that the subscriber terminal operates within an area covered by at least one of the subscriber network elements having the identity of the subscriber terminal in the register of new subscribers thereof.

20. (New) The method of claim 17, further comprising:

changing the home area after the home area has been previously determined for the subscriber terminal, the changing including:

adding the identity of the subscriber terminal to the register of new subscribers of at least one subscriber network element in the system;

providing the subscriber terminal with free mobility for a duration of a determination of the home area, such that the subscriber terminal operates in both the determined home area and in an area covered by at least one of the subscriber network elements having the identity of the subscriber terminal in the register of new subscribers thereof; and

forwarding a location updating message to at least one of the subscriber network elements having the identity of the subscriber terminal in the register of new subscribers thereof.

IN THE ABSTRACT:

Please delete the present Abstract and replace it with the following new Abstract.

The invention relates to a method and system of determining a home area for a subscriber terminal in a radio system in which the subscriber terminal includes measuring means for measuring signal strengths received from different base stations and for storing measurement results in a memory. In order for the home area to be determined rapidly and efficiently, the method includes receiving a location updating message from the subscriber terminal, transmitting a command to the subscriber terminal after the location updating message has been received wherein the command is to transmit the measurement results stored in the memory to the subscriber terminal, receiving the measurement results from the subscriber terminal, identifying the base stations with the greatest signal strengths at least partially based on the measurement results, and determining the home area of the subscriber terminal such that the home area includes at least one of the identified base stations.

REMARKS


Consideration and allowance of the present application is respectfully requested. By this Amendment, claims 1-10 are amended to merely clarify the recited subject matter, new claims 11-20 are added to more fully claim the disclosed invention, and the Specification and Abstract are amended to confirm with U.S. practice.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned **“Version with markings to show changes made”**.

In view of the foregoing, the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

PILLSBURY WINTHROP LLP

By: 
Christine H. McCarthy
Reg. No.: 41,844
Tel. No.: (202) 861-3075
Fax No.: (202) 822-0944

CHM/JMS
1100 New York Avenue, NW
Ninth Floor
Washington, DC 20005-3918
(202) 861-3000
Enclosure: Appendix

APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

At the top of the first page, just under the title, insert

☒ --This application is the National Phase of International Application PCT/FI99/00813 filed October 1, 1999 which designated the U.S. and that International Application [X] was [] was not Published under PCT Article 21(2) in English.- -

IN THE CLAIMS:

Please amend claims 1-10 as follows:

1. (Amended) A method of determining a home area for a subscriber terminal in a radio system where the subscriber terminal [comprises] includes measuring means for measuring [the] strengths of signals [it has] received from different base stations and for storing [the] measurement results in a memory, the method comprising: [a step of]

receiving a location updating message from the subscriber terminal; []
[characterized in that the method comprises steps of]

transmitting [, after the location updating message has been received,] a command to the subscriber terminal [to transmit the measurement results it has stored in the memory] after the location updating message has been received, wherein the command is to transmit the measurement results stored in the memory of the subscriber terminal; []

receiving the measurement results from the subscriber terminal; []

identifying the base stations with the greatest signal strengths at least partially based on [the basis of] the measurement results; [] and

determining the home area of the subscriber terminal such that [it] the home area includes at least one of the identified base stations.

2. (Amended) [A] The method [according to] of claim 1, [characterized by] further comprising preventing the subscriber terminal from setting up communication links via [other] base stations other than those which belong to [its] the subscriber terminal's home area after determining the [a] home area [has been determined] for the subscriber terminal.

3. (Amended) [A] The method [according to] of claim 1, [or 2, characterized in that] wherein [said] the subscriber terminal is a new subscriber terminal and [,] the method further comprises: [also comprising steps of]

adding [the] an identity of the subscriber terminal to a register of new subscribers of at least one subscriber network element in the system; [,] and

providing [said] the subscriber terminal with free mobility for the duration of the determination of the home area, such that the subscriber terminal operates within an area covered by at least one of the subscriber network elements [which have] having the identity of [said] the subscriber terminal in [their] the register of new subscribers thereof.

4. (Amended) [A] The method [according to] of claim 1 [or 2, characterized in that a] further comprising changing the home area after the home area has been previously determined for [said] the subscriber terminal, [and the home area is changed by means of steps of] the changing including:

adding the identity of the subscriber terminal to the register of new subscribers of at least one subscriber network element in the system; [,]

providing [said] the subscriber terminal with free mobility for the duration of the determination of the home area, such that the subscriber terminal operates [not only] in both the [previously] determined home area and [but also] in an area [that is] covered by at least one of the subscriber network elements [which have] having the identity of [said] the subscriber terminal in [their] the register of new subscribers thereof; [,] and

waiting for a location updating message to be forwarded from the subscriber terminal via at least one of the [a] subscriber network [element which has] elements having the identity of [said] the subscriber terminal in [its] the register of new subscribers thereof.

5. (Amended) A wireless local loop radio system comprising:

a plurality of subscriber terminals [(1, 5) comprising] including:

measuring means for measuring [the] strengths of signals [they have] received from different base stations [(BTS1 - BTS10)] and for storing [the] measurement results in a memory, and

transmitting means for transmitting location updates to other parts of the system; [, and]

a subscriber network element [(DAX1-DAX3, BSC1, BSC2) which communicates] configured to communicate with an exchange [(LE1, LE2, MSC)] and including [which comprises] transmitting means for transmitting telecommunication signals between the subscriber terminals and the exchange via the base stations; [, characterized in that the system comprises]

detecting [detection] means [(4, HLR)] for detecting a location updating message transmitted by a particular subscriber terminal; [,]

command transmitting means [(4, HLR)] for transmitting a command to [said] the particular subscriber terminal [to transmit the measurement results stored in the memory of the subscriber terminal] after [the detection means have detected] detecting [a] the location updating message transmitted by [said] the subscriber terminal, wherein the command is to transmit the measurement results stored in the memory of the subscriber terminal; [,]

receiving means for receiving the measurement results transmitted by [said] the subscriber terminal; [,]

identifying [identification] means [(4, NMS)] for identifying the base stations with the strongest signals at least partially based on [the basis of] the measurement results received from the subscriber terminal; [,] and

determining means [(4, NMS)], responsive to the identification means, for determining a home area for [said] the subscriber terminal such that [said] the home area includes at least one of the identified base stations.

6. (Amended) [A] The radio system [according to] of claim 5,
[characterized in] wherein

[that said] the subscriber network element [(DAX1 - DAX3)] communicates with a local exchange [(LE1, LE2)] of [the] a public switched telephone network [in order] to transmit telecommunication signals between the subscriber terminals [(1)] and the local exchange [(LE1, LE2)] via the base stations [(BTS1 - BTS7)], [and that it] wherein the subscriber network element is provided with a register [(2)] of new subscriber terminals, and

[that] wherein the [detection] detection means [(4) detect] detects location updating messages transmitted by one of the [a] subscriber terminals [terminal (1)] the identity of which is stored in the register [(2)] of new subscriber terminals.

7. (Amended) [A] The radio system [according to] of claim 5,
[characterized in that said] wherein the subscriber network element [consists of] includes a base station controller [(BSC1, BSC2) of the cellular radio system], [which communicates] the base station controller being configured to communicate with a mobile services switching centre [(MSC) in order] to transmit telecommunication signals between the subscriber terminals and the mobile services switching centre via the base stations [(BTS8 - BTS10)].

8. (Amended) A subscriber network element [(DAX1 - DAX3)]
comprising:

transceiving means for setting up a communication link to an exchange for transmitting telecommunication signals between subscriber terminals and the exchange; [and]

a register [(2)] of new subscriber terminals [, which stores the] being configured to store identities of [the] new subscriber terminals, [characterized in that the subscriber network element comprises]

detecting [detection] means [(4)] for detecting a location updating message containing the subscriber identity stored in the register [(2)] of the new subscriber terminals; [,]

transmitting means [(4)] which, after said detection of the location updating message, transmit] for transmitting [to the subscriber terminal which transmitted the location updating message] a command [to transmit the measurement results stored in a memory means of the subscriber terminal] to [the subscriber network element] a particular subscriber terminal which transmitted the location updating message after the detection of the location updating message, wherein the command is to transmit the measurement results stored in the memory of the particular subscriber terminal;

receiving means [(4)] for receiving the measurement results transmitted by [said] the subscriber terminal; [,]

identifying [identification] means [(4)] for identifying the base stations with the strongest signals at least partially based on [the basis of] the measurement results received from the subscriber terminal; [,] and

determining means [(4)], responsive to the identification means, for determining a home area for [said] the subscriber terminal such that [said] the home area includes at least one of the identified base stations.

9. (Amended) A subscriber terminal [(1, 5)] of a radio system, comprising: transceiving [transceiver] means for setting up a communication link via [the] a radio path to other parts of the system; [,]

measuring means for measuring [the] strengths of signals received from different base stations [(BTS1 - BTS10)] and for storing [them] measured results in a memory; [,] and

transmitting means for transmitting a location updating message to the other parts of the system, [characterized in that]

wherein the transceiving [transceiver] means are arranged to transmit the measurement results stored in the memory [means] to the other parts of the system in response to a predetermined command received by the subscriber terminal.

10. (Amended) The [A] subscriber terminal [according to] of claim 9, [characterized in that] wherein the transmitting means are arranged to transmit [said] the measurement results in a short message to the other parts of the system.

Claims 11-20 are newly presented.

IN THE ABSTRACT:

Please amend the Abstract as follows:

The invention relates to a method and system of determining a home area for a subscriber terminal in a radio system [where] in which the subscriber terminal includes [comprises] measuring means for measuring [the] signal strengths [of signals it has] received from different base stations and for storing [the] measurement results in a memory[.]. In order for the home area to be determined rapidly and efficiently, the method [comprising a step of] includes receiving a location updating message from the subscriber terminal. [In order that the home area could be determined rapidly and efficiently, the method comprises steps of] transmitting [, after the location updating message has been received,] a command to the subscriber terminal [to transmit the measurement results it has stored in the memory] after the location updating message has been received wherein the command is to transmit the measurement results stored in the memory to the subscriber terminal, receiving the measurement results from the subscriber terminal, identifying the base stations with the greatest signal strengths at least partially based on [the basis of] the measurement results, and determining the home area of the subscriber terminal such that [it] the home area includes at least one of the identified base stations.

[(Figure 1)]

APPLICATION UNDER UNITED STATES PATENT LAWS

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Invention: METHOD OF DETERMINING HOME AREA FOR SUBSCRIBER TERMINAL, AN ASSOCIATED
 RADIO SYSTEM AND A SUBSCRIBER NETWORK ELEMENT

Inventor (s): AHOLA, Ossi
 PELTOLA, Marjo
 SUONVIERI, Jukka
 TUSA, Kai

Pillsbury Winthrop LLP
 Intellectual Property Group
 1100 New York Avenue, NW
 Ninth Floor
 Washington, DC 20005-3918
 Attorneys
 Telephone: (202) 861-3000

This is a:

- ☐ Provisional Application
- ☐ Regular Utility Application
- ☐ Continuing Application
☒ The contents of the parent are incorporated by reference
- ☒ PCT National Phase Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application
- ☐ Substitute Specification
Sub. Spec Filed _____
 in App. No. _____ / _____
- ☐ Marked up Specification re
Sub. Spec. filed _____
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SPECIFICATION

METHOD OF DETERMINING HOME AREA FOR SUBSCRIBER TERMINAL, AN ASSOCIATED RADIO SYSTEM AND A SUBSCRIBER NETWORK ELEMENT

The invention relates to determination of a home area in a cellular radio system where the mobility of subscriber terminals can be restricted such that the terminals only operate in radio cells included in the home area assigned to them. The invention relates primarily to a wireless local loop (WLL) system, which utilizes fixed subscriber terminals. Since subscriber terminals in WLL systems are generally installed fixedly in a particular location, it is not usually necessary to provide the terminals with mobility, i.e. ability to set up a data link via any base station in the system. Even if WLL subscriber terminals were terminals in a cellular radio system which also comprises mobile subscriber terminals (which are provided with the aforementioned mobility), it is preferable that the mobility can be eliminated or at least restricted to certain cells for WLL terminals which do not necessarily need free mobility. In such a manner it is possible to reduce the number of location updates and handover operations required, which saves system resources. There is thus a need in WLL systems to determine a home area for each subscriber terminal.

In prior art arrangements a home area is determined for a specific subscriber terminal in such a way that when a subscriber terminal is added to the system, the operator checks for example from a map which radio cell presumably covers best the geographical area where the subscriber terminal will be placed. The operator thereafter determines this radio cell as the home area of the subscriber terminal. The greatest drawback of this known arrangement is that the field strength of a specific radio cell may vary to a great extent from one place to another within the cell, especially in urban areas where buildings interfere with the propagation of signals. This means that the determination of a home area for a particular subscriber terminal can fail if the home area is selected entirely on the basis of the map.

Another alternative manner of determining a home area for a subscriber terminal is naturally that the operator sends a maintenance man to the place of location of the terminal to carry out measurements on the field strength. The actual field strengths of different cells are thus detected at the location of the subscriber terminal. However, in practice it is too slow and expensive to send a maintenance man to the place of location of the subscriber terminal.

The purpose of the present invention is to solve the aforementioned problem and to provide an arrangement for the determination of a subscriber terminal's home area such that the most suitable home area can be selected for each subscriber terminal in an easy and reliable manner. This objective is achieved with a method according to the invention of determining a home area for a subscriber terminal in a radio system where the subscriber terminal comprises measuring means for measuring the strengths of signals it has received from different base stations and for storing the measurement results in a memory, the method comprising a step of receiving a location updating message from the subscriber terminal. The method according to the invention is characterized in that the method comprises steps of transmitting, after the location updating message has been received, a command to the subscriber terminal to transmit the measurement results it has stored in the memory, receiving the measurement results from the subscriber terminal, identifying the base stations with the greatest signal strengths on the basis of the measurement results, and determining the home area of the subscriber terminal such that it includes at least one of the identified base stations.

The invention also relates to a wireless local loop radio system where the method according to the invention can be applied, the radio system comprising subscriber terminals comprising measuring means for measuring the strengths of signals they have received from different base stations and for storing the measurement results in a memory, and transmitting means for transmitting location updates to other parts of the system, and a subscriber network element which communicates with an exchange and which comprises means for transmitting telecommunication signals between the subscriber terminals and the exchange via the base stations. The system according to the invention is characterized in that the system comprises detection means for detecting a location updating message transmitted by a particular subscriber terminal, transmitting means for transmitting a command to said particular subscriber terminal to transmit the measurement results stored in the memory of the subscriber terminal after the detection means have detected a location updating message transmitted by said subscriber terminal, receiving means for receiving the measurement results transmitted by said subscriber terminal, identification means for identifying the base stations with the strongest signals on the basis of the measurement results received from the subscriber terminal, and means, responsive to the identification means, for determining a home

area for said subscriber terminal such that said home area includes at least one of the identified base stations.

The invention further relates to a subscriber network element which can be applied in the system according to the invention, the element comprising means for setting up a communication link to an exchange for transmitting telecommunication signals between subscriber terminals and the exchange, and a register of new subscriber terminals, which stores the identities of the new subscriber terminals. The subscriber network element according to the invention is characterized in that the subscriber network element comprises
5 detection means for detecting a location updating message containing the subscriber identity stored in the register of new subscriber terminals, transmitting means which, after said detection of the location updating message, transmit to the subscriber terminal which transmitted the location updating message a command to transmit the measurement results stored in a memory
10 means of the subscriber terminal to the subscriber network element, receiving means for receiving the measurement results transmitted by said subscriber terminal, identification means for identifying the base stations with the strongest signals on the basis of the measurement results received from the subscriber terminal, and means, responsive to the identification means, for determining a home area for said subscriber terminal such that said home area includes at least one of the identified base stations.

Also, the invention relates to a subscriber terminal of a radio system, which can be applied in the system according to the invention and which comprises transceiver means for setting up a communication link via the radio
25 path to other parts of the system, measuring means for measuring the strengths of signals received from different base stations and for storing them in a memory, and means for transmitting a location updating message to the other parts of the system. The subscriber terminal according to the invention is characterized in that the transceiver means are arranged to transmit the measurement results stored in the memory means to the other parts of the
30 system in response to a predetermined command received by the subscriber terminal.

The basic idea of the invention is that when a home area of a subscriber terminal is determined on the basis of field strength measurements carried out by the subscriber terminal itself, the determination of the home area becomes easier and more accurate. The determination of the home area is
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thus based on the actual situation at the location where the subscriber terminal will be installed, which means that the field strengths of different radio cells can be taken into account. A home area can also be determined very easily and rapidly when the subscriber terminal is commanded to transmit over the radio path the measurement results of signals it has received from different base stations after the subscriber terminal has transmitted a location update to the network for the first time. Therefore the measurement results transmitted by the subscriber terminal can be used to identify the base station(s) with the greatest field strength in the place of location of the subscriber terminal, whereafter the terminal can be assigned a home area containing at least one of these base stations.

The greatest advantages of the invention are as follows: the determination of a home area is based on the actual situation in the place of installation of the subscriber terminal (and not on a situation assumed to exist only on the basis of the map, for example), the determination of a home area can be activated immediately when the subscriber terminal is switched on in the place of installation, which can be detected when the terminal transmits a location updating message, and reactivation of the subscriber terminal after its location has been changed is rapid since the required manual procedures can be performed in advance such that a location updating message transmitted by the subscriber terminal from the new place of location triggers a chain of events where the system automatically and rapidly determines a new home area for the subscriber terminal, whereafter the terminal operates normally.

The preferred embodiments of the method, system and subscriber terminal according to the invention are disclosed in the appended dependent claims 2 to 4, 6, 7 and 10.

The invention will be described below in greater detail by way of example with reference to the accompanying drawings, in which

Figure 1 is a flowchart of a first preferred embodiment of the method according to the invention,

Figure 2 is a block diagram of a first preferred embodiment of the system according to the invention, and

Figure 3 is a block diagram of a second preferred embodiment of the system according to the invention.

Figure 1 is a flowchart of the first preferred embodiment of the method according to the invention. The flowchart of Figure 1 can be used, for

example, in a WLL system shown in Figure 2, where a subscriber network element communicates with a local exchange of a public switched telephone network PSTN.

In block A, the identity of a subscriber terminal is stored in a register of new subscriber terminals of one or more subscriber network elements. The subscriber terminal can be a terminal which will be used for the first time, or alternatively, a terminal which has already been previously assigned a home area but which changes its location so that the home area must be reassigned. The identity of the subscriber terminal is preferably stored in the registers of new subscriber terminals of all the subscriber network elements which are situated near the future place of location of the subscriber terminal, determined on the basis of the map, for example.

In block B, a temporary subscriber connection and subscriber number are activated for the subscriber terminal to each local exchange of the PSTN which is connected to a subscriber network element storing the identity of the subscriber terminal in its register of new subscriber terminals.

Block C comprises a step of creating addresses for the subscriber terminal in the interfaces between the local exchanges and the subscriber network elements.

When the operations shown in blocks A to C have been carried out, the subscriber terminal can be used in the areas of all the subscriber network elements which have the identity of the new subscriber stored in their memory. The process is thereafter on hold until the subscriber terminal transmits a location update.

When a location update has been detected, the process moves from block D to block E where a command is transmitted to the subscriber terminal ordering it to transmit the measurement results. According to the invention, subscriber terminals continuously measure the strengths of the signals they have received from different base stations and store the measurement results in a memory. A subscriber terminal may store in its memory, for example, the data of the five strongest base stations (at least the signal strengths and the identity of the base station or its location area). Therefore data about the strongest base stations in the place of location of the subscriber terminal is always stored in the memory.

The command to transmit the measurement results can be transmitted to the subscriber terminal for example in a short message. The com-

mand can be transmitted either immediately after the location update has been received or, alternatively, for example not until the following night (when the network traffic load is low).

- 5 Block F comprises receiving the measurements results transmitted by the subscriber terminal for example in a short message. The measurement results are used to identify the base stations (radio cells) with the highest field strength in the place where the subscriber terminal will be installed.

- 10 In block G, a home area including at least one of the identified base stations is determined for the subscriber terminal. When the invention is applied for example in a WLL system based on the GSM (Global System for Mobile communications) system, a home area can be determined such that it consists of the location area of the strongest base station. In practice this means that all the base stations that belong to the aforementioned location area also belong to the home area of the subscriber terminal, whereupon the subscriber terminal is able to use all these base stations for communication.
- 15 The subscriber terminal is thereafter prevented from using other base stations than those which belong to its home area for communication.

- 20 In block H, all the unnecessary data is deleted from the system. In other words, after the home area has been determined, the identity of the subscriber terminal can be deleted from the registers of new subscriber terminals of all the subscriber network elements which stored it during the determination process. Correspondingly, the unnecessary subscriber connections and subscriber numbers that were created temporarily can be deleted from the local exchanges, and similarly the unnecessary allocations concerning the subscriber terminal can be deleted from the interfaces between the local exchanges and the subscriber network elements. The data is maintained only in the subscriber network element and the local exchange which control the home area of the subscriber terminal. If the subscriber terminal has changed its home area, also the temporary subscriber number created in the new local exchange is replaced with the earlier subscriber number of the terminal (which is no longer needed in the old local exchange).
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- 35 The flowchart of Figure 1 is highly advantageous if the location of the subscriber terminal is to be changed in connection with a move, for example. In such a case the steps of blocks A to C can be programmed to the system in advance. When the location of the subscriber terminal changes in connection with a move, the location update detected in block D triggers auto-

matic execution of blocks E to H in the network without any operation being required from the operator. Therefore the subscriber terminal automatically operates in its new place of location and the subscriber does not have to wait for the operator to reprogram the network manually regarding his subscriber terminal. However, it must be noted that if the subscriber terminal changes its location such that the new place of location is situated under the control of the same subscriber network element as the original place of location, the subscriber terminal cannot be switched on in the old place of location after the operations in blocks A to C have been carried out. Otherwise there is a risk that due to the location update originating from the old place of location the network may assume that the subscriber terminal has already changed its location, whereafter the network erroneously determines in blocks E to H the old location of the subscriber terminal as its home area.

Figure 2 is a block diagram of the first preferred embodiment of the system according to the invention. The WLL system shown in Figure 2 comprises three subscriber network elements DAX1 - DAX3, which communicate with a local exchange of the PSTN, i.e. LE1 and LE2, respectively. The interface between the subscriber network elements and the local exchanges can be, for example, a standardized digital V5 interface, such as V5.1 or V5.2, the latter interface also enabling concentration (more subscribers than time slots). In the situation shown in Figure 2, the local exchanges, the subscriber network elements and the network management system NMS are also connected together via a data communication network DCN.

The WLL system shown in Figure 2 can be based on the GSM system, for example. The subscriber network elements DAX1 - DAX3 may be based on mobile services switching centres of the GSM system, and properties that are irrelevant to the WLL system (such as properties related to hand-over operations which are not needed in the system of Figure 2 since the subscriber terminals are not provided with mobility) have been deleted from the switching centres. The subscriber network elements DAX1 - DAX3 are also programmed to operate together with the local exchanges of the PSTN, such that for example the dialled numbers (in connection with an outgoing call) received from the subscriber terminals are forwarded to the local exchanges for analysis.

Subscriber network element DAX1 is connected in Figure 2 to three base stations BTS1 - BTS3. The base stations are divided into two different

location areas such that location area LA1 comprises two base stations BTS1 and BTS2 and location area LA2 comprises one base station. Base stations BTS4 - BTS6 under the control of subscriber network element DAX2 belong to the same location area LA3. Subscriber network element DAX3 controls one base station BTS7 the location area of which is LA4.

In the following, it is assumed that a subscriber terminal 1 is taken into use for the first time in the system of Figure 2. The WLL subscriber terminal 1 shown in Figure 2 may consist of, for example, a terminal equipment comprising a radio part and a teleadapter, and a user interface connected to the terminal equipment, i.e. a PSTN telephone set, such as a phone, telefax or a computer/modem combination.

When the subscriber terminal is taken into use, the operator first finds out which subscriber network elements serve areas near the future place of location A1 of the subscriber terminal. It can be seen from Figure 2 that only subscriber network element DAX1 serves the future place of location A1 of the subscriber terminal 1. The operator therefore adds the identity of the subscriber terminal in a register 2 of new subscribers of subscriber network element DAX1. The operator also activates a subscriber connection and a subscriber number from the local exchange LE1 for the subscriber terminal 1. Further, the operator reconfigures the V5 interface between the local exchange LE1 and subscriber network element DAX1 to take into account the needs of the new subscriber terminal 1. The operator carries out the aforementioned operations in advance, for example when the subscriber terminal 1 is sold. After these operations the subscriber terminal 1 can be used within the entire area covered by subscriber network element DAX1, which means that the subscriber terminal can freely utilize any one of base stations BTS1 - BTS3 for communication.

After the user of the subscriber terminal 1 has installed the terminal in place and switched it on, the subscriber terminal 1 operates in the same way as a GSM system mobile station, i.e. first it performs measurements on the field strength in order to identify the strongest base station. It stores the measurement results in a memory. After the subscriber terminal 1 has identified the base station with the greatest field strength on the basis of the measurements, i.e. for example base station BTS2, it transmits a location update via this base station to the other parts of the system.

A control unit 4 of the subscriber network element DAX1 comprises detection means, which continuously monitor location updating messages transmitted to the subscriber network element and compare international mobile subscriber identities IMSI contained therein with the identities stored in the register 2 of new subscriber terminals. Therefore the detection means detect that the location updating message originating from the subscriber terminal 1 arrives from a new subscriber terminal. Transmitting means contained in the control unit of subscriber network element DAX1 thereafter transmit to the subscriber terminal 1 a message, for example in a short message, which commands the subscriber terminal 1 to transmit the measurement results stored in its memory. The transmitting means can transmit the message immediately or, alternatively, for example the following night when the network traffic load is low.

When the subscriber terminal 1 receives the command to transmit the measurement results, it retrieves from its memory for example the measurement results of the five strongest base stations, which it then transmits in a short message. The measurement results are forwarded to identification means, which may be placed in subscriber network element DAX1 or, alternatively, for example in the network management system NMS. The identification means identify the base stations with the highest field strength in the place of location A1 of the subscriber terminal 1 on the basis of the measurement results, i.e. base stations BTS2 and BTS3 in Figure 2. The system thereafter determines for the subscriber terminal a home area including at least one of the identified base stations.

The home area of the subscriber terminal can be determined, for example, such that the location area of the base station with the best audibility is selected as the home area. In other words, if base station BTS2 has the best audibility, location area LA1 is selected as the home area of the subscriber terminal 1. The subscriber terminal 1 is then able to utilize also base station BTS1 for communication since the location area of base station BTS1 is also LA1. Alternatively, the home area can be determined on the basis of the base station identity, in which case the subscriber terminal is able to utilize only this particular base station for communication.

When a home area has been determined for the subscriber terminal 1, the network management system deletes the identity of the subscriber ter-

minimal from the register 2 of new subscriber terminals of subscriber network element DAX1.

If the place of location of the subscriber terminal 1 is to be changed later, for example to place of location A2, this is carried out similarly as described above. However, in such a case the operator adds the identity of the subscriber terminal in the registers 2 of new subscriber terminals of two different subscriber network elements DAX2 and DAX3, since both subscriber network elements control a base station covering area A2. Correspondingly, a subscriber connection and a temporary number are activated to the local exchange LE2 for the use of the subscriber terminal. The operator also reconfigures the V5 interfaces between the local exchange LE2 and subscriber network elements DAX2 and DAX4 in order to take into account the needs of the new subscriber terminal 1.

When the subscriber terminal has moved to area A2, it transmits a location update forwarded to either subscriber network element DAX2 or DAX3. The subscriber network element which has received the location update, for example subscriber network element DAX2, continues operation as described above in connection with the introduction of a new subscriber terminal (a command to transmit measurement results, and transmission of the measurement results to the identification means). When a home area has been determined for the subscriber terminal, the network management system NMS deletes the unnecessary data from the network, whereafter the subscriber terminal 1 can utilize only the base stations included in its home area. The NMS deletes the data of the subscriber terminal from the registers of new subscriber terminals of subscriber network elements DAX2 and DAX3, and cancels the allocation of the V5 interface between subscriber network element DAX3 and local exchange LE2. The temporary number activated to local exchange LE2 is replaced with the number of the subscriber terminal used in local exchange LE1. The data of the subscriber terminal is simultaneously deleted from subscriber network element DAX1 and from the interface between subscriber network element DAX1 and local exchange LE1.

Figure 3 is a block diagram of a second preferred embodiment of the system according to the invention. The embodiment of Figure 3 differs from the embodiment of Figure 2 in that it shows a part of the GSM mobile system which also serves WLL subscribers in addition to conventional GSM mobile stations. In the situation shown in Figure 3, the subscriber network

elements consist of base station controllers BSC1 and BSC2 of the GSM system, which control three base stations BTS8 - BTS10.

When a home area is being determined for a subscriber terminal 5 in place of location A3, the operator stores data about the determination of the home area for example in a home location register HLR of the subscriber terminal. When the HLR thereafter receives a location update from the subscriber terminal, it detects that a home area is being determined for the terminal. The system transmits to the subscriber terminal a short message containing a command to transmit measurement results. The results transmitted by the subscriber terminal 5 are forwarded to the network management system NMS. The NMS thereafter identifies the strongest base stations from the measurement results and determines a home area for the subscriber terminal 5 on the basis thereof. The data about the home area can be stored, for example, in the home location register HLR in connection with other subscriber data.

In the system of Figure 3, the same subscriber terminal 5 can be assigned a home area which consists of radio cells that are spaced apart and belong to different location areas. If the home of the user of the subscriber terminal 5 is situated for example in area A3 and for example his vacation home in area A4, it can be determined in the home location register HLR that the home area of the subscriber terminal 5 consists of location areas LA5 and LA6. The subscriber terminal is thus able to utilize all the base stations in location areas LA5 and LA6. Since the home area is stored in the home location register HLR of the subscriber in connection with the other subscriber data, the information about the home area is also transmitted between different networks together with the rest of the subscriber data, for example to a visitor location register of another mobile services switching centre. Therefore the home area of the subscriber terminal 5 can also consist of radio cells situated within areas of different mobile services switching centres.

For example, if location area LA5 has already been determined as the home area of the subscriber terminal 5 and the home area should be expanded such that the terminal also operates in area A4, this can be implemented for instance in such a way that the home location register HLR is programmed to wait for a location update which is transmitted via the base station controller BSC2, whereafter the home location register activates the determination of the home area as described above. However, in such a case the home area is not restricted only to the location area LA6 of the strongest base

station BTS10, but also the old home area can still be used such that the new home area consists of location areas LA5 and LA6.

- 5 It should be understood that the above description and the related drawings are only intended to illustrate the present invention. Different variations and modifications of the invention will be obvious to those skilled in the art without departing from the scope and spirit of the invention disclosed in the appended claims.

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CLAIMS

1. A method of determining a home area for a subscriber terminal in a radio system where the subscriber terminal comprises measuring means for measuring the strengths of signals it has received from different base stations and for storing the measurement results in a memory, the method comprising a step of

receiving a location updating message from the subscriber terminal,
characterized in that the method comprises steps of
transmitting, after the location updating message has been received, a command to the subscriber terminal to transmit the measurement results it has stored in the memory,
receiving the measurement results from the subscriber terminal,
identifying the base stations with the greatest signal strengths on
the basis of the measurement results, and
determining the home area of the subscriber terminal such that it includes at least one of the identified base stations.

2. A method according to claim 1, **characterized** by preventing the subscriber terminal from setting up communication links via other base stations than those which belong to its home area after a home area has been determined for the subscriber terminal.

3. A method according to claim 1 or 2, **characterized** in that said subscriber terminal is a new subscriber terminal, the method also comprising steps of
adding the identity of the subscriber terminal to a register of new subscribers of at least one subscriber network element, and
providing said subscriber terminal with free mobility for the duration of the determination of the home area, such that the subscriber terminal operates within an area covered by the subscriber network elements which have the identity of said subscriber terminal in their register of new subscribers.

4. A method according to claim 1 or 2, **characterized** in that a home area has been previously determined for said subscriber terminal, and the home area is changed by means of steps of

- adding the identity of the subscriber terminal to the register of new subscribers of at least one subscriber network element in the system,

providing said subscriber terminal with free mobility for the duration of the determination of the home area, such that the terminal operates not only in the previously determined home area but also in an area that is covered by the subscriber network elements which have the identity of said subscriber terminal in their register of new subscribers, and

waiting for a location updating message to be forwarded from the subscriber terminal via a subscriber network element which has the identity of said subscriber terminal in its register of new subscribers.

5. A wireless local loop radio system comprising subscriber terminals (1, 5) comprising measuring means for measuring the strengths of signals they have received from different base stations (BTS1 - BTS10) and for storing the measurement results in a memory, and transmitting means for transmitting location updates to other parts of the system, and

a subscriber network element (DAX1-DAX3, BSC1, BSC2) which communicates with an exchange (LE1, LE2, MSC) and which comprises means for transmitting telecommunication signals between the subscriber terminals and the exchange via the base stations, **characterized** in that the system comprises

detection means (4, HLR) for detecting a location updating message transmitted by a particular subscriber terminal,

transmitting means (4, HLR) for transmitting a command to said particular subscriber terminal to transmit the measurement results stored in the memory of the subscriber terminal after the detection means have detected a location updating message transmitted by said subscriber terminal,

receiving means for receiving the measurement results transmitted by said subscriber terminal,

identification means (4, NMS) for identifying the base stations with the strongest signals on the basis of the measurement results received from the subscriber terminal, and

means (4, NMS), responsive to the identification means, for determining a home area for said subscriber terminal such that said home area includes at least one of the identified base stations.

6. A radio system according to claim 5, **characterized** in that said subscriber network element (DAX1 - DAX3) communicates with a local exchange (LE1, LE2) of the public switched telephone network in

order to transmit telecommunication signals between the subscriber terminals (1) and the local exchange (LE1, LE2) via the base stations (BTS1 - BTS7), and that it is provided with a register (2) of new subscriber terminals, and

that the detection means (4) detect location updating messages transmitted by a subscriber terminal (1) the identity of which is stored in the register (2) of new subscriber terminals.

7. A radio system according to claim 5, **characterized** in that said subscriber network element consists of a base station controller (BSC1, BSC2) of the cellular radio system, which communicates with a mobile services switching centre (MSC) in order to transmit telecommunication signals between the subscriber terminals and the mobile services switching centre via the base stations (BTS8 - BTS10).

8. A subscriber network element (DAX1 - DAX3) comprising means for setting up a communication link to an exchange for transmitting telecommunication signals between subscriber terminals and the exchange, and

a register (2) of new subscriber terminals, which stores the identities of the new subscriber terminals, **characterized** in that the subscriber network element comprises

detection means (4) for detecting a location updating message containing the subscriber identity stored in the register (2) of new subscriber terminals,

transmitting means (4) which, after said detection of the location updating message, transmit to the subscriber terminal which transmitted the location updating message a command to transmit the measurement results stored in a memory means of the subscriber terminal to the subscriber network element,

receiving means (4) for receiving the measurement results transmitted by said subscriber terminal,

identification means (4) for identifying the base stations with the strongest signals on the basis of the measurement results received from the subscriber terminal, and

means (4), responsive to the identification means, for determining a home area for said subscriber terminal such that said home area includes at least one of the identified base stations.

9. A subscriber terminal (1, 5) of a radio system, comprising

transceiver means for setting up a communication link via the radio path to other parts of the system,

measuring means for measuring the strengths of signals received from different base stations (BTS1 - BTS10) and for storing them in a memory,

5 and

means for transmitting a location updating message to the other parts of the system, **characterized** in that

the transceiver means are arranged to transmit the measurement results stored in the memory means to the other parts of the system in response to a predetermined command received by the subscriber terminal.

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10. A subscriber terminal according to claim 9, **characterized** in that the transmitting means are arranged to transmit said measurement results in a short message to the other parts of the system.

1/3

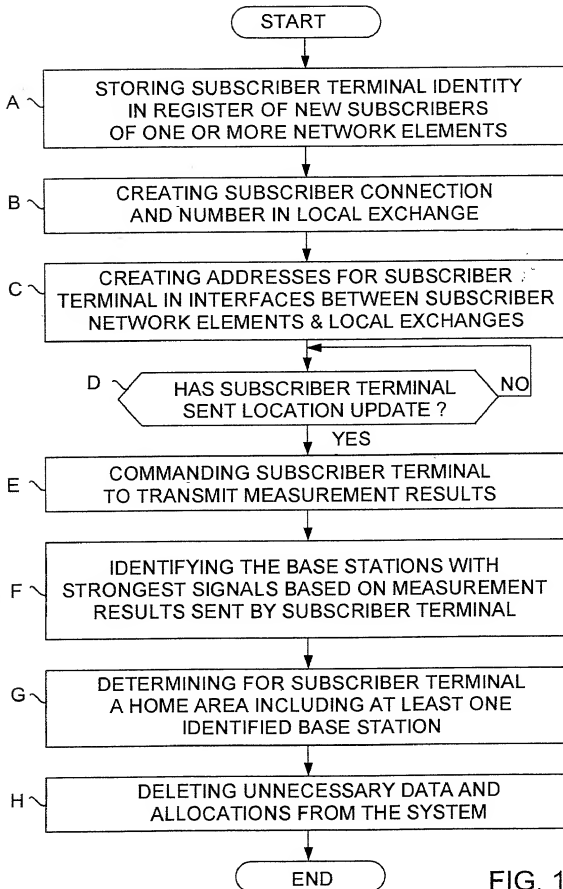


FIG. 1

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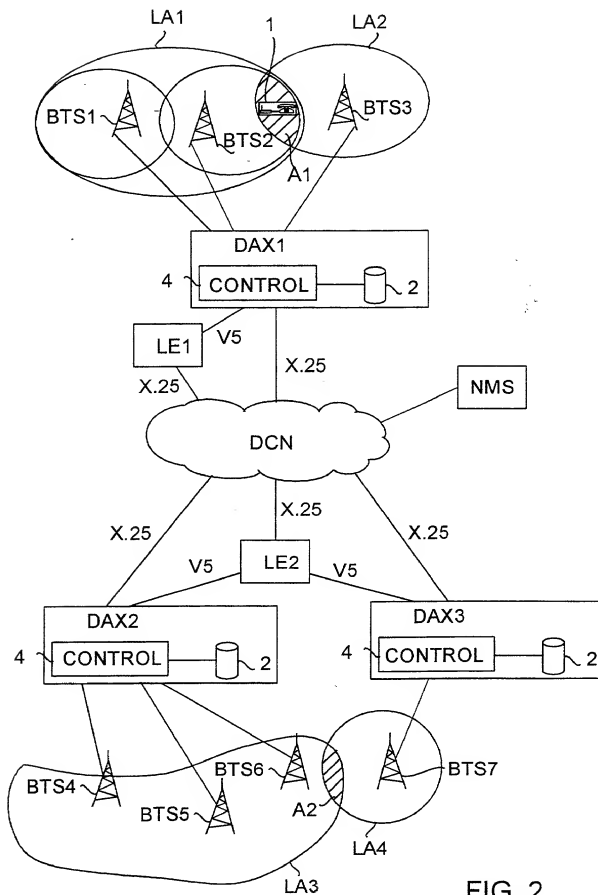


FIG. 2

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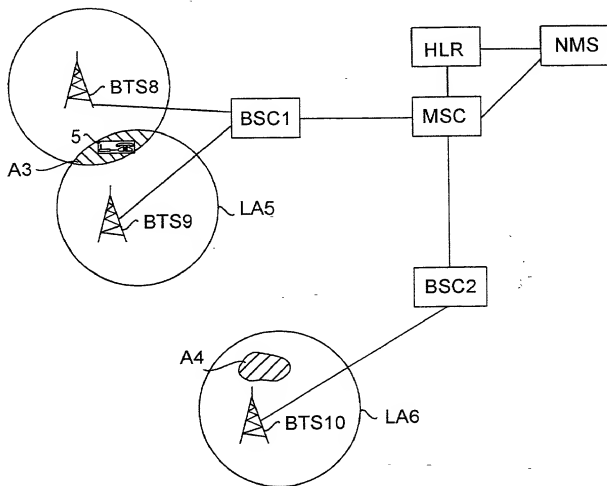


FIG. 3

FOR UTILITY/DESIGN
CIP/PCT NATIONAL/PLANT
ORIGINAL/SUBSTITUTE/SUPPLEMENTAL
DECLARATIONS

RULE 63 (37 C.F.R. 1.63)
DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PM & S
FORM

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the INVENTION ENTITLED
METHOD OF DETERMINING HOME AREA FOR SUBSCRIBER TERMINAL, AN ASSOCIATED RADIO SYSTEM AND A SUBSCRIBER
NETWORK ELEMENT

the specification of which (CHECK applicable BOX(ES))
X ☐ is attached hereto.
BOX(ES) B. ☐ was filed on _____ as U.S. Application No. _____
C. X was filed as PCT International Application No. PCT/F199 /00813 on 1 October 1999
and (if applicable to U.S. or PCT application) was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56. Except as noted below, I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) of no priority claimed, before the filing date of this application

PRIOR FOREIGN APPLICATION(S)

Number	Country	Day/MONTH/Year Filed	Date first laid-open or Published	Date Patented or Granted	Priority NOT Claimed
982126	Finland	1 October 1998			

If more prior foreign applications, X box at bottom and continue on attached page.

Except as noted below, I hereby claim domestic priority benefit under 35 U.S.C. 119(e) or 120 and/or 365(c) of the indicated United States applications listed below and PCT International applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)

Application No. (series code/serial no.)	Day/MONTH/Year Filed	Status pending, abandoned, patented	Priority NOT Claimed

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon

And I hereby appoint Pillsbury Winthrop LLP, Intellectual Property Group, 1100 New York Avenue, N.W., Ninth Floor, East Tower, Washington, D.C. 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above firm and/or a below attorney in writing to the contrary

Paul N. Kokulis	16773	Paul E. White, Jr.	32011	Stephen G. Glazier	31361	William P. Atkins	39821
Raymond F. Lippitt	17518	Glenn J. Perry	28458	Ruth N. Morduch	31044	Paul L. Sharer	36004
G. Lloyd Knight	17518	Kendrew H. Colton	30368	Richard H. Zaitlen	27248	Robin L. Teskin	35030
Kevin E. Joyce	20508	G. Paul Edgell	24238	Roger R. Wise	31204		
George M. Sinila	18221	Lynn E. Eccleston	35661	Michael R. Dzwonczyk	36787		
Donald J. Bird	25323	Timothy J. Klima	34852	W. Patrick Bengtsson	32456		
Peter W. Gowdey	25872	David A. Jakopin	32995	Jack S. Barufka	37087		
Dale S. Lazar	28872	Mark G. Paulson	30793	Adam R. Hess	41835		

(1) INVENTOR'S SIGNATURE: [Signature] Date: 23 4 2001

Ossi		AHOLA	
First	Middle Initial	Family Name	
Residence	Kyröskoski	Finland	Finland
City	State/Foreign Country		Country of Citizenship
Mailing Address	Eteläntie 33, FIN-39200 Kyröskoski, Finland		
(Include Zip Code)			

(2) INVENTOR'S SIGNATURE: [Signature] Date: 2 5 2001

Majo		PELTOLA	
First	Middle Initial	Family Name	
Residence	Tampere	Finland	Finland
City	State/Foreign Country		Country of Citizenship
Mailing Address	Tsoniemenkatu 24, FIN-33400 Tampere, Finland		
(Include Zip Code)			

"X" box X FOR ADDITIONAL INVENTORS, and proceed on the attached page to list each additional inventor.

☐ See additional foreign priorities on attached page (incorporated herein by reference).

DECLARATION AND POWER OF ATTORNEY

(continued)

Page 2

ADDITIONAL INVENTORS

3-00
(3) INVENTOR'S SIGNATURE: *Jukka Soelle*

Date: 4.5.01

Jukka		SUONVIERI	
First	Middle Initial	Family Name	
Residence	Teräslähti	Finland	Finland
City	State/Foreign Country	Country of Citizenship	
Post Office Address	NEEUVORENTIE 43 34260 TERÄSLÄHTI FINLAND		
(include Zip Code)			

(4) INVENTOR'S SIGNATURE: *Sanja Tusa*

Date: 2.5.01

Kai		TUSA	
First	Middle Initial	Family Name	
Residence	Pirkkala	Finland	Finland
City	State/Foreign Country	Country of Citizenship	
Post Office Address	Elinantie 11, FIN-33950 Pirkkala, Finland		
(include Zip Code)			

(5) INVENTOR'S SIGNATURE:

Date:

First	Middle Initial	Family Name	
Residence	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(6) INVENTOR'S SIGNATURE:

Date:

First	Middle Initial	Family Name	
Residence	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(7) INVENTOR'S SIGNATURE:

Date:

First	Middle Initial	Family Name	
Residence	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(8) INVENTOR'S SIGNATURE:

Date:

First	Middle Initial	Family Name	
Residence	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(9) INVENTOR'S SIGNATURE:

Date:

First	Middle Initial	Family Name	
Residence	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			